

Environmental, health, safety and sustainability data and analytics

Benefits to performance and the bottom line

Advances in data management and analytics have generated compelling value in business areas like finance, marketing and logistics. While leading companies have earned significant returns on IT investments in these areas, many have overlooked the benefits of advanced data management and analytics for environmental, health, safety and sustainability (EHSS) management. Data and analytics are an integral part of leading EHSS management programs and can contribute to reductions in incidents and operational overhead that directly impact the bottom line, improve employee morale and strengthen the reputation of the business.

Safety and environmental impacts on the business and the bottom line

Every year, more than 4,000 Americans die from workplace injuries. Another 50,000 die from illnesses where workplace conditions were a contributing factor, and 3 million Americans suffer non-fatal workplace injuries or illnesses.¹ The US Department of Labor estimates that occupational injuries and illnesses cost US businesses \$170 billion annually,² and a 2015 study by the National Safety Council estimated that the average workplace injury can cost a company approximately \$39,000 in compensation, productivity, and medical and administrative expenses.³ The US Centers for Disease Control estimates that the cost of a workplace fatality is upwards of \$1 million.⁴ These numbers do not include indirect costs such as negative impacts on

employee morale, legal fees, property damage, and the impacts on families, communities and the reputation of the business. These indirect costs can be several times the direct cost of an incident.⁵

Civil penalties resulting from the failure to comply with environmental regulations are also a significant cost to business. Companies paid over \$19.5 billion in environmental fines, clean-up fees and other monetary commitments resulting from US Environmental Protection Agency (EPA) enforcement actions in 2016.⁶ In addition, aging infrastructure and assets and an increased emphasis on upstream and downstream data collection for regulatory compliance have created significant financial burdens for companies. For example, the US Department of Transportation Pipeline and Hazardous Materials Safety Administration reports that there were 635 oil pipeline incidents, such as ruptures or leaks, in 2016, resulting in over \$300 million in costs.⁷ Recent changes in the regulatory landscape, such as European Union Registration, Authorisation, Evaluation and Restriction Chemicals (REACH) and Conflict Minerals in the United States, are also requiring companies to obtain more information from their suppliers. The volume of information and variety of data collection points necessary to maintain compliance with these regulations make it extremely difficult and resource intensive to manage without the appropriate IT systems.



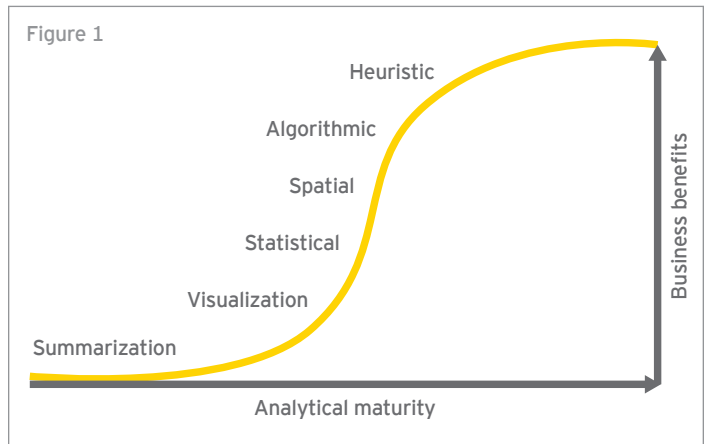
Current state: EHSS analytical maturity and the benefit to the business

Figure 1 displays the relationship between analytical maturity and EHSS business benefits given the current state of the market. EHSS analytical capabilities observed in the market range from basic data collection and summarization of key performance indicators (KPIs) to automated data collection (robotics) and artificial intelligence (heuristics). Many firms are currently operating at or near the lower end of the maturity-benefit spectrum by collecting a limited number of EHSS data points and calculating lagging summary performance indicators for corporate or regulatory reporting purposes. While this provides some important EHSS performance insight, there are significant opportunities to the business by updating the company's EHSS data management program to anticipate risk, identify opportunities and protect assets. Companies can make these investments in a phased approach to facilitate their return on investment while transitioning their analytical maturity for EHSS data. This approach is similar to what many companies used when upgrading their analytical capabilities for operational and financial data.

Improved EHSS performance: the benefits of data visualization and predictive analytics

Many organizations fail to recognize the benefits of investing in data visualization and predictive analytics for EHSS although they have been investing in it for years for financial and operational data. Advanced analytics for EHSS can have equally beneficial results. For example, a research team at Carnegie Mellon University recently developed leading safety indicator statistical and algorithmic analyses that were able to predict workplace incidents with 85% accuracy.⁸ Advanced analytics may also be especially valuable for high-performing organizations that may not have sufficient populations of real incident data to create statistically robust analytical models.

Committing to an EHSS data analytics and performance management process can provide significant financial and operational returns. For example, according to the Campbell Institute, a leading manufacturer of engine parts implemented a Safety Observation System that facilitated employee reporting and analysis of unsafe behaviors and conditions that led to incidents and observed a 50% reduction in recordable injuries from 2010 to 2013.⁹ New and innovative technologies such as wearables, remote sensors and artificial intelligence are making it easier than ever to collect, manage and analyze leading EHSS data to predict and address areas of risk and inefficiency. These technologies, however, should be coupled with the organizational prioritization of EHSS and the ability to recognize the financial benefits of incident prevention.



Types of analysis	
Summarization	High-level summary statistics and KPIs to assess and report organizational EHSS performance (e.g., spreadsheets)
Visualization	Charts, graphs and displays that facilitate visual identification of EHSS performance trends and anomalies
Statistical	Analysis using more advanced statistical methods, such as regression or Monte Carlo simulations, to assess the relationships between EHSS variables, predict areas of risk and assess performance scenarios
Spatial	Maps, statistics and visual analytics that incorporate geospatial information to assess EHSS performance and risk at physical locations – includes the use of remote sensor networks and other remote data capture tools
Algorithmic	Machine-assisted, routinized assessment of EHSS performance conditions that incorporates partially automated data collection, red flags and notification triggers to improve the consistency, quality and expediency of decision-making
Heuristic	Machine-assisted analytics that integrate artificial intelligence and robotics to perform novel analytics, such as vector analysis, to identify EHSS trends and insights

Real-world examples of advanced EHSS analytics and robotics



Analyzing employee/contractor training and job experience data to identify and pre-emptively address gaps correlated with incidents and injuries



Using remote data collection technologies and analytical tools, such as drones, multi-spectral imaging and image recognition artificial intelligence, to monitor assets and infrastructure and obtain real-time information on EHSS performance and risk



Analyzing supplier, materials and regulatory compliance data to identify and implement more effective procurement, product stewardship and regulatory compliance strategies



Performing routine inspections of site conditions, job hazards, ergonomics and employee/contractor behaviors using mobile, standardized data capture solutions – like tablets, smartphones and wearables – and analyzing this data to identify and proactively address EHSS risk

Example return on investment

Safety

In 2015, the US Department of Labor reported that there were 3.8 recordable non-fatal injuries per 100 workers in the manufacturing sector.¹⁰ The table below shows the estimated payback period for an investment in manufacturing workplace safety analytics, assuming the incident cost of \$39,000 reported by the National Safety Council and a reduction in incident rates of between 10% and 25%. The payback periods demonstrate that investments to reduce injury rates can quickly recoup their costs in savings from avoided injury costs. Additional benefits such as improved employee morale, avoided fatalities and an established reputation as a safe and responsible workplace are likely to provide additional returns and further expedite payback.

Employees	\$1 million investment payback period (in years)	
	Incident rate reduction 10%	Incident rate reduction 25%
5,000	1.3	0.5
10,000	0.7	0.3
20,000	0.3	0.1
50,000	0.1	0.1
100,000	0.1	0.1

Environmental

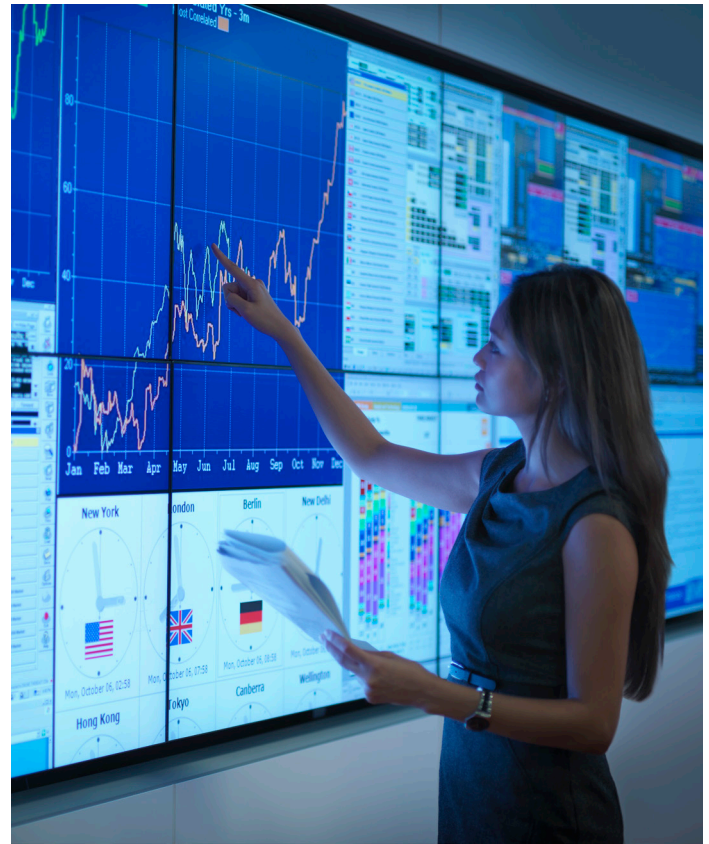
Leading companies recognize the value in investing in data and analytics that help to identify potential environmental costs and risks and addressing them before they are realized. The remediation costs, operational disruption and civil penalties for an environmental incident vary depending on the severity and nature of the incident and may significantly impact the bottom line. For example, failure to identify and address refrigerant leaks cost several retailers millions of dollars in EPA fines and remediation fees in 2016.¹¹ A robust air quality management data and analytics solution may have helped to identify and address these leaks before regulatory action was taken. The cost of such a solution would likely have been significantly less than the regulatory penalties and could help identify and prevent future air quality fines.



Planning considerations for EHSS data visualization and analytic transformation

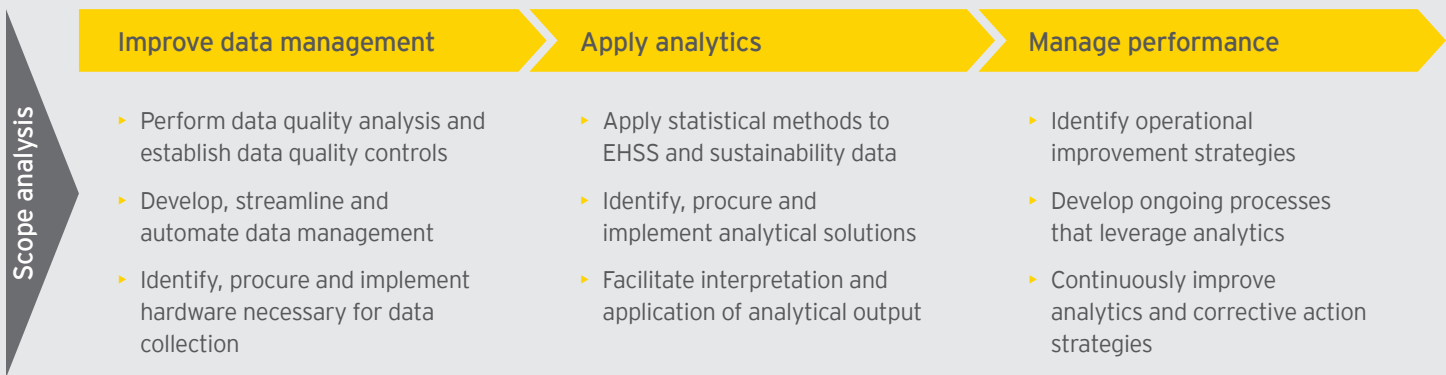
It is useful to develop a clear strategic road map when advancing the EHSS data visualization and data analytical capabilities of an organization. Organizations should consider the following to ease their transition and enhance their IT investments:

- ▶ **IT solution alignment** – Data visualization and analytics require companies to collect uniform, consistent and accurate data. Inventorying and aligning data collection processes, management systems, hardware and analytical procedures across the enterprise increase the availability and potency of analytics that can be performed. They also help identify where streamlining of data processes can begin.
- ▶ **End-user uptake and usage** – Collecting data at lower organizational levels may require simplified user interfaces and collection prompts that allow for timely and accurate collection of information across multiple topical areas. Data collection is often predicated on how easily users can access data entry points and quickly enter relevant information for analysis.
- ▶ **Reducing complexity where possible** – Organizations should consider the development of data visualization and analytics so that the user is involved and accepts the changes, the resulting output is effective, and the data architecture and analytical procedures are low maintenance.



The path to EHSS data analytics

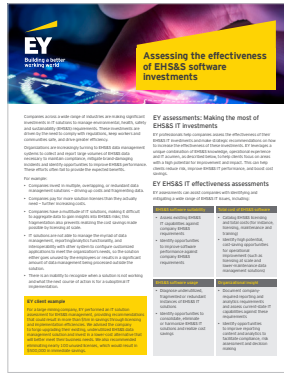
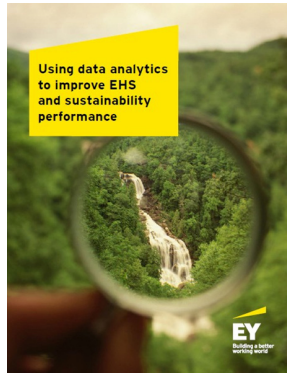
Effective business analytics are not solely derived from off-the-shelf models and methods. They require significant preparation and organizational change management in order to:



Technology is rapidly changing the way companies approach EHSS. EY can assist you with developing and implementing your data and analytics strategy. Our global network of EHSS and IT professionals can help you identify and implement leading practices in EHSS data and analytics.

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Other noteworthy publications



Sources

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